

# Integrating AI into pediatric dental practice: current applications and future directions.

Riya Choudhary<sup>1</sup>, Priyanka Choudhary<sup>2</sup>, Jyoti Kasana<sup>3</sup>

<sup>1</sup>BDS, Santosh Dental College, Ghaziabad, India

Email : Riyachoudhary0427@gmail.com

<sup>2</sup>Dental Surgeon at The Smile Dental Clinic, New Friends Colony, New Delhi, India

Email :Priyankachoudhary.dr@gmail.com

<sup>3</sup>Assistant Professor, North DMC Medical College and Hindu Rao Hospital, Delhi, India

Email :Kasanajt@gmail.com

## ABSTRACT

The integration of artificial intelligence (AI) in pediatric dentistry is transforming clinical practices by enhancing diagnostic accuracy, treatment planning, and overall patient care. Advanced technologies like machine learning (ML) and deep learning (DL) are now being used to analyse radiographic images, predict the risk of dental caries, and detect anomalies early in their development. AI-powered predictive models assist in creating effective treatment plans by forecasting tooth eruption patterns and identifying malocclusions at an early stage. Tools such as virtual dental assistants and chatbot applications are also playing a vital role in patient education and appointment management, increasing engagement while reducing administrative burdens. Moreover,

AI-driven data analysis enables personalized treatment approaches tailored to each child's unique needs. As these technologies continue to evolve, AI holds the promise to revolutionize pediatric dentistry by streamlining workflows, improving clinical outcomes, and strengthening evidence-based decision-making.

**Keywords:** Artificial Intelligence (AI), Application, Clinical Decision Support, Deep Learning (DL), Diagnostic Accuracy, Machine Learning (ML), Personalized Treatment Planning. Tooth Eruption

**How to cite this article:** Choudhary R, Choudhary P, Kasana J, Integrating AI into pediatric dental practice: current applications and future directions...Int J Drug Deliv Technol. 2026;16(2s): 639-644; DOI: 10.25258/ijddt.16. 639-644

**Source of support:** Nil.

**Conflict of interest:** None

## INTRODUCTION

The concept of "Artificial Intelligence" (AI) was first introduced in 1943, but it wasn't until John McCarthy coined the term during a conference in 1956 that the framework for creating machines capable of replicating human tasks began to take shape [1].

AI represents a remarkable technological advancement that has quickly gained traction within the realms of science and technology [2]. Its significant reliance on imaging makes it a critical component of modern dentistry. AI offers considerable benefits in the continuous assessment and monitoring of patient health, understanding long-term drug effects, and proactively identifying health-related risks. By potentially minimizing the extensive hours that dental professionals typically invest, AI not only promises to enhance health outcomes at reduced costs but also fosters personalized, preventative, and predictive dentistry, ultimately leading to integrated healthcare solutions for all [3].

Most importantly, AI has the capacity to raise the standards of dental care, refining the accuracy and efficacy of diagnoses, generating superior visual treatment plans, simulating clinical outcomes, and anticipating oral diseases and health issues [4].

Furthermore, AI models have garnered recognition as auxiliary tools that bolster the precision and accuracy of medical diagnoses. The technology has seen widespread

application in medical sciences, demonstrating remarkable effectiveness in various patient care tasks, including disease diagnosis and risk identification for disease development [5].

Defining AI is inherently complex; however, it fundamentally represents a machine algorithm adept at reasoning and executing cognitive functions. In contemporary applications, particularly in medicine and dental, the reliance has shifted from traditional hand-crafted guidelines to two predominant branches: machine learning (ML) and deep learning (DL) [6].

ML focuses on developing algorithms and statistical models through computer systems to enhance cognitive capabilities and understanding. It involves training algorithms on extensive datasets to identify patterns, which are then utilized to make predictions or decisions regarding new data. Conversely, DL, a subset of machine learning, leverages artificial neural networks to emulate the learning mechanisms found in the human brain. This approach necessitates the use of vast amounts of data and sophisticated algorithms, resulting in greater accuracy [7].

A specific branch of DL, known as the Artificial Neural Network (ANN), consists of interconnected units, or neurons, organized in layers; deep learning effectively deals with ANNs that comprise multiple hidden layers. Convolutional neural networks (CNNs), a subclass of ANN, have gained prominence in both dentistry and general

\*Author for Correspondence: Riyachoudhary0427@gmail.com

medicine. By integrating a subsampling layer akin to a multilayer perceptron along with fully connected layers, CNNs can thoroughly analyze images, effectively replicating functionalities of the visual cortex [8].

#### The role of Ai in healthcare

The adoption of artificial intelligence (AI) technologies in medicine has seen substantial growth, particularly in the area of computer vision. Several key factors have been identified as drivers of this trend

**Essential Role of Diagnostic Imaging:** AI plays a crucial role in diagnostic imaging across various healthcare disciplines, helping to mitigate the variability associated with subjective assessments. It enhances the quality of care while reducing costs by automating routine tasks.

**Abundance of Digital Health Data:** The collection of digital health data is widespread. Although these data sets have been somewhat inconsistent in the past, there is a growing effort among organizations to ensure that they are cleaned, curated, and structured for better usability.

**Integration of Diverse Data Domains:** AI facilitates the integration of various levels of health data, including medical and dental histories, socio-demographic information, clinical data, imaging data, biomolecular data, and social network data. This capability allows for a more comprehensive understanding of the interactions between these diverse data types.

**Enhancement of Research and Discovery:** AI contributes to research by offering in silico experimentation options that augment traditional research methodologies. This complements existing modeling strategies and enhances the overall research

#### framework.

**Streamlining Routine Tasks:** AI technologies can streamline routine administrative duties, thereby increasing the amount of face-to-face time that healthcare providers, including doctors and dentists, spend with their patients. Innovations such as voice, speech, and text recognition further support this goal by reducing the time required for record-keeping .

**Promoting Participatory Healthcare:** AI holds the potential to make healthcare more participatory. When patients actively contribute their data, for instance through wearable devices, they can engage more in self-monitoring and self-management of their health.

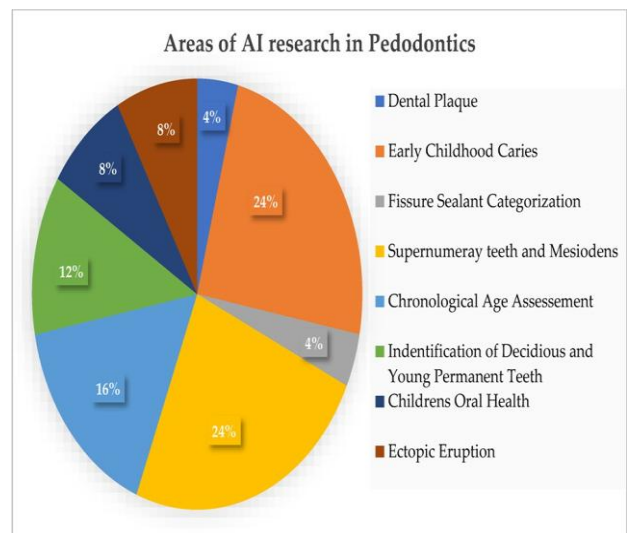
**Continuous Monitoring for Improved Care:** The ongoing collection of health data can address the limitations of "on-off medicine" , wherein patients receive brief visits with healthcare professionals. A continuous, non-invasive monitoring approach allows for a deeper understanding of the factors that contribute to health and disease, particularly for conditions that develop over extended periods, such as periodontal disease.

**Reduction of Diagnostic and Treatment Costs:** AI has the potential to lower diagnostic and treatment expenses, alleviating strain on healthcare systems that are increasingly grappling with an aging population and a rise in complex, chronic illnesses. It may also help address workforce shortages, which are anticipated to persist in many regions, thus supporting the goals set forth by the World Health Organization (WHO) [9-12].

#### AI role in pediatric dentistry

The integration of AI systems as supportive tools for dentists significantly enhances the quality of dental care. This partnership is expected to yield improved predictions of treatment outcomes, as well as enhancements in diagnostic accuracy and treatment planning. While deep learning mainly aids in diagnostic procedures, AI technologies are also known to enhance precision and efficiency, ultimately boosting the productivity of dental practitioners. The application of AI has permeated multiple areas of endodontics and pedodontics , addressing issues such as root fractures, periapical lesions, dental caries, stem cell viability, and the complexities of root canal anatomy. As data accessibility has increased, AI has emerged as a crucial component in demonstrating its advantages across various pediatric dental procedures. Specifically, Convolutional Neural Network (CNN) models are employed in pediatric dentistry to facilitate faster and more precise diagnoses. This advancement not only enhances treatment efficacy but also fosters better patient cooperation, which contributes to higher success rates in dental interventions [11-14].

The pie chart titled "Area of Research in Pedodontics" visually represents the various subfields within pediatric dentistry. Each segment of the chart corresponds to a specific area of research, illustrating the distribution of focus among these topics by analyzing the chart, one can identify key areas of advancement and interest in pedodontics, showcasing how researchers allocate their efforts to improve dental health outcomes.



#### Description

#### Identification of Mesiodens and Supernumerary Teeth Using Artificial Intelligence

Artificial intelligence (AI) has emerged as a valuable tool in the detection of mesiodens through the application of single deep learning models . The inability to identify supernumerary teeth on panoramic radiographs often stems from the limited expertise of less experienced dental

professionals. Moreover, many general dentists may lack the proficiency needed to diagnose mixed dentition in pediatric patients effectively. In light of these challenges, convolutional neural network (CNN)-based deep learning approaches offer significant assistance in the screening process for supernumerary teeth.

Kuwada et al. highlighted that deep learning algorithms, including DetecNet and

AlexNet, demonstrate promise in detecting maxillary impacted supernumerary teeth on panoramic radiographs, yet they acknowledged that the presence of unerupted permanent teeth complicates detection. Additionally, Ha et al. [24] proposed a YOLOv3-based model for identifying mesiodens across panoramic radiographs representing various dentition types (primary, mixed, and permanent). Their study indicated that this model was effective in clinical contexts when compared to the findings based on permanent dentition reported by Kuwada et al.. The YOLO methodology exemplifies a robust deep learning detection technique, outperforming other algorithms in this domain. Nonetheless, the limitation of a smaller sample size was noted, emphasizing the need for larger, multi-center studies to enhance model performance.

In conclusion, the adoption of CNN-based deep learning technologies holds great promise for supporting dental practitioners in their diagnostic efforts. Nevertheless, further enhancements are necessary to enable its robust clinical application. In the near future, the development of a comprehensive diagnostic system that caters to a broader range of age groups and clinical conditions will be essential. Consequently, the integration of CNN-based deep learning may enhance screening capabilities among general dentists while allowing pediatric specialists to formulate treatment plans more proactively [15].

## 2 Early childhood caries

Early Childhood Caries (ECC) is a complex issue influenced by multiple factors. The interplay between environmental, behavioral, and potentially genetic contributors raises questions about the existence of underlying biological mechanisms that may exacerbate the risk of caries development. Although numerous studies have identified genes and polymorphisms linked to dental lesions, there remains a dearth of research focusing on genetic factors associated with ECC.

In a study by Park et al., several machine learning algorithms—specifically XGBoost, Random Forest, and LightGBM—were evaluated against a logistic regression model for early childhood caries detection. Although the comparisons showed no significant differences in outcomes, Koopaie et al. employed both statistical analysis and machine learning techniques to assess salivary cystatin S levels among ECC patients in comparison to caries-free individuals. Their research utilized various supervised

learning models, including feed-forward neural networks, XGBoost, Random Forest, and Support Vector Machines (SVM), revealing that machine learning approaches could enhance the differentiation between ECC patients and healthy controls by incorporating salivary cystatin S levels.

Moreover, while machine learning does not simplify the identification of crucial factors influencing ECC, it aids in developing algorithms that account for a multitude of variables and their complex interactions, suggesting its potential as a valuable screening tool in dentistry.

The COVID-19 pandemic has led many individuals to opt for online consultations, highlighting the need for parents to be well-informed about their children's oral health and dental hygiene practices. To optimize these questions, a study by Ramos-Gomez et al. utilized a machine learning algorithm, Random Forest (RF), to identify the most predictive questions from parent questionnaires regarding the presence of active caries. These insights facilitated subsequent physical assessments of study participants [16].

### 3. Categorization of Fissure Sealants

CNNs represent a critical component of deep learning algorithms, leveraging large datasets to support dental practitioners in their diagnostics. Furthermore, dental sealants, typically white in appearance, are often the first line of defense against dental problems, making them relatively easy to identify. This necessitates the fine-tuning of CNNs to accurately recognize dental sealants as a logical approach. A research team led by Schlickerieder, A. et al. developed a deep learning-based CNN specifically designed to detect these sealants in machine-readable intraoral photographs. The performance of this AI-driven algorithm demonstrated significantly higher diagnostic accuracy compared to traditional CNN classification methods. However, several limitations were identified, including the need for further dental research, repeated training for optimal detection, and a thorough categorization of various diseases and corresponding restorative procedures before this AI-enhanced CNN can be effectively implemented in clinical settings [17].

## Chronological Age Assessment in Children and Adolescents through Neural Modeling

In their study, Zaborowicz, K. et al. introduced a novel approach for estimating the chronological age of children and adolescents aged 4 to 15 years utilizing digital pantomographic images combined with neural modeling. This innovative method is not only straightforward but also boasts near-perfect accuracy. It is unique for its application of pantomographic images in metric age assessment; however, it has a notable limitation in that it does not incorporate 2D photographs, as it is solely reliant on pantomographic imagery [18].

Additionally, research by Zaborowicz, M. et al. employed three deep neural network models to assess the chronological age of children and adolescents within the same age range, demonstrating that neural modeling algorithms can effectively predict metric age based on specific dental and skeletal markers. Bunyarit, S.S. et al. applied an artificial neural network (ANN) approach to establish new dental maturity classifications derived from Demirjian's scoring system, revealing that these refined maturity scores can accurately assess the age of Malaysian Chinese children and adolescents [19].

## Ectopic Eruption of the First Permanent Molar

Clinical and radiological assessments are essential for diagnosing ectopic eruptions. Various radiographic modalities, such as cone beam computed tomography (CBCT) panoramic, occlusal, and periapical imaging, are utilized for diagnostic purposes. Panoramic radiographs, in particular, provide comprehensive evaluations of all teeth and surrounding structures, aiding in the identification of tooth positioning and ectopic eruptions. However, these 2D images present limitations, including restricted magnification and the overlap of anatomical structures [20]. Recent advancements in radiomics and artificial intelligence (AI) have transformed the diagnostic landscape. Multi-layered convolutional neural networks (CNNs) enhance the accuracy, consistency, and comprehensiveness of diagnoses. Research by Zhu et al. indicated that the nnU-Net model outperformed other frameworks like U-Net, R2U-Net, and attention U-Net in detecting and segmenting ectopic eruptions during the mixed dentition period. Their performance analysis revealed that nnU-Net excelled in semantic augmentation. Despite the complexities of semantic segmentation, the flexibility of nnU-Net allows it to adapt to diverse datasets by modifying features such as data processing and training methodologies. Liu et al. developed an automated screening system capable of identifying ectopic maxillary molar eruptions with an accuracy comparable to that of pediatric dentists. Their findings suggest that AI-based image recognition can enhance the diagnostic precision of human practitioners, although it is important to note that deep learning systems are not infallible [21].

### 6. Evaluating Children's Oral Health Through Machine Learning Toolkits

Gajic et al. explored the influence of oral health on the quality of life among adolescents using statistical and AI methodologies. They found a consensus between human intuition and machine learning algorithms regarding the categorization of responses. AI enabled the segmentation of respondents into distinct groups, uncovering insights that might not be evident through intuitive methods linked to demographic variables like gender.

The outcomes from machine learning-based toolkits can be beneficial for dentists, parents, and children alike, facilitating a clearer understanding of individual oral health needs and treatment requirements. Moving forward, it's essential for dental education to integrate clinical AI solutions while promoting digital literacy among future dental professionals. Therefore, the incorporation of machine learning into dentistry holds considerable promise, yielding rapid and more accurate results [22].

### AI in behavior management in pedodontics

In recent years, there have been significant advancements in behavior management strategies within pediatric dentistry. Traditional methods have been improved with novel approaches aimed at reducing anxiety, encouraging cooperation, and promoting favorable oral health outcomes. Non-pharmacological techniques, including effective

communication, the tell-show-do method, and positive reinforcement, have been instrumental in building trust and diminishing fears. Furthermore, the advent of virtual reality (VR) and augmented reality (AR) technologies has introduced powerful means of distraction and engagement during dental procedures. Advances in sedation and anesthesia techniques have also allowed for safer and more customized management of anxious or uncooperative children. Involving parents and collaborating with other professionals, such as child psychologists and pediatricians, enhances behavior guidance strategies. The integration of digital tools, interactive media, and educational games not only empowers children to take an active role in their oral health care but also fosters cooperation and contributes to their long-term dental well-being. Collectively, these innovations aim to cultivate a positive and comfortable atmosphere, helping children develop a lifelong appreciation for dental visits [23].

### Future of ai in pediatric dentistry

**Table.** AI in Dentistry Now and in a Possible Future Scenario

Aspect	Now	Future
Sample size	Largely under 2,000 instances/images	Millions of multi-level connected instances
Data sources	Single hospitals, insurance claims data	Federated learning; data from multiple institutions
Focus	Detection of structures on imagery, association modelling	Multi-class detection of pathologies, predictive decision support
Training mode	Supervised learning Testing mode Cross-validation Hold-out test set, independent datasets	Unsupervised or semi-supervised learning
Testing mode	Cross-validation	Hold-out test set, independent datasets
Metrics	Measures of accuracy (accuracy, area-under-the-curve, F1-score, segment overlap, etc.)	Measures of value (impact on treatment decisions and patient-reported outcomes, cost-effective trustworthiness (explainable AI))
Study types	Diagnostic accuracy studies retrospectively collected data	Randomized controlled trials or large cohort studies collecting data prospectively

To fully harness the potential of artificial intelligence (AI) in pediatric dentistry, several essential advancements must occur. First, there is a need for more advanced AI algorithms capable of integrating and analyzing complex data from genetic, environmental, and lifestyle factors. This endeavor necessitates further investigations into how these

diverse data sources correlate with oral health outcomes in children, ultimately leading to the development of more precise and personalized risk assessments and treatment strategies [24].

Moreover, practical measures should be implemented to enhance the integration of AI into wearable devices and smart toothbrushes. This involves refining sensor technologies and data integration systems to enable continuous, non-invasive monitoring of oral health, providing real-time, actionable feedback to patients and their caregivers. To bolster preventive care, these devices should be connected to AI-driven platforms that can predict and address oral health challenges proactively [25].

In terms of enhancing the patient experience, the development of AI-driven virtual and augmented reality (VR and AR) applications should be prioritized to facilitate better behavior management during dental visits. Research should focus on customizing these technologies for children, aiming to reduce dental anxiety and enhance engagement with oral health education [26].

For broader implementation, it is crucial to integrate AI with electronic health records (EHRs) and dental practice management systems. Research is needed to create seamless and secure interfaces that optimize administrative processes, automate patient communication, and improve follow-up care. Collaboration between AI developers and dental professionals is vital to ensure these systems meet the specific needs of pediatric dentistry.

Lastly, AI holds the potential to transform pediatric dental research by analyzing large datasets to identify trends and predict outcomes. Future research should concentrate on developing AI tools capable of real-time analysis of these datasets, which could result in the discovery of innovative treatment protocols and enhanced clinical decision-making. To facilitate effective implementation, AI technologies must be made more accessible and affordable, necessitating collaboration between industry leaders and healthcare policymakers to ensure widespread integration into dental practices [27-30].

## CONCLUSION

In conclusion, it is clear that while AI cannot replace dental clinicians or pediatric dentists, it can significantly enhance various aspects of dental health care, including preventive and restorative dentistry as well as diagnostics. AI has already been implemented in pediatric dentistry to support less experienced practitioners in achieving more accurate diagnoses. These models are valuable at both the individual and community levels, effectively identifying and categorizing children into risk groups, detecting early ectopic eruption, assessing age, and more. Additionally, AI can assist in planning and evaluating school oral health programs, helping to increase children's awareness of their dental health. Employed as a complementary tool, AI should be used in a controlled manner to ensure that the essential human touch in dental care remains intact, emphasizing that dentists and pediatric dentists retain control over treatment protocols and decision-making. The future holds the promise of

collaborative efforts between dental practitioners and AI for improved patient care

## REFERENCE

1. Tandon, D.; Rajawat, J. Present and future of artificial intelligence in dentistry. *J. Oral. Biol. Craniofac. Res.* 2020, 10, 391–396. [Google Scholar] [CrossRef] [PubMed]
2. Vardhe R, Valvi S, Vyavahare S, Shah MA. The Role of Artificial Intelligence in Dentistry: A Narrative Review. *Oral Sphere J. Dent. Health Sci.* 2025;1(1):41-47. doi: <https://doi.org/10.63150/osjdhs.2025.35>
3. Gajic, M.; Vojinovic, J.; Kalevski, K.; Pavlovic, M.; Kolak, V.; Vukovic, B.; Mladenovic, R.; Aleksic, E. Analysis of the Impact of Oral Health on Adolescent Quality of Life Using Standard Statistical Methods and Artificial Intelligence Algorithms. *Children* 2021, 8, 1156. [Google Scholar] [CrossRef] [PubMed]
4. Artificial Intelligence (AI) In Dentistry. Available online: [dentalreach.today](https://dentalreach.today) (accessed on 4 January 2023).
5. The Topol Review. 2019. The Topol review: preparing the healthcare workforce to deliver the digital future [accessed 2020 Mar 9]. <https://topol.hee.nhs.uk/>.
7. Kuwada, C.; Arijji, Y.; Fukuda, M.; Kise, Y.; Fujita, H.; Katsumata, A.; Arijji, E. Deep learning systems for detecting and classifying the presence of impacted supernumerary teeth in the maxillary incisor region on panoramic radiographs. *Oral Surg. Oral Med. Oral Pathol. Oral Radiol.* 2020, 130, 464–469. [Google Scholar] [CrossRef]
8. V K, B KR, PD MK. Performance of Artificial Intelligence in Diagnosing Dental Caries: An Umbrella Review. *Oral Sphere J. Dent. Health Sci.* 2025;1(2):80-94. doi: <https://doi.org/10.63150/osjdhs.2025.5>
9. Mine, Y.; Iwamoto, Y.; Okazaki, S.; Nakamura, K.; Takeda, S.; Peng, T.; Mitsuhata, C.; Kakimoto, N.; Kozai, K.; Murayama, T. Detecting the presence of supernumerary teeth during the early mixed dentition stage using deep learning algorithms: A pilot study. *Int. J. Paediatr. Dent.* 2022, 32, 678–685. [Google Scholar] [CrossRef] [PubMed]
11. Zaorska, K.; Szczapa, T.; Borysewicz-Lewicka, M.; Nowicki, M.; Gerreth, K. Prediction of Early Childhood Caries Based on Single Nucleotide Polymorphisms Using Neural
12. Networks. *Genes* 2021, 12, 462. [Google Scholar] [CrossRef] [PubMed]
13. Karhade, D.S.; Roach, J.; Shrestha, P.; Simancas-Pallares, M.A.; Ginnis, J.; Burk, Z.J.S.; Ribeiro, A.A.; Cho, H.; Wu, D.; Divaris, K. An Automated Machine Learning Classifier for Early Childhood Caries. *Pediatr. Dent.* 2021, 15, 191–197. [Google Scholar]
14. Koopaie, M.; Salamati, M.; Montazeri, R.; Davoudi, M.; Kolahdooz, S. Salivary cystatin S levels in children with

- early childhood caries in comparison with caries-free children; statistical analysis and machine learning. *BMC Oral Health* 2021, 21, 650. [Google Scholar] [CrossRef] [PubMed]
15. Ramos-Gomez, F.; Marcus, M.; Maida, C.A.; Wang, Y.; Kinsler, J.J.; Xiong, D.; Lee, S.Y.; Hays, R.D.; Shen, J.; Crall, J.J.; et al. Using a Machine Learning Algorithm to Predict the Likelihood of Presence of Dental Caries among Children Aged 2 to 7. *Dent. J.* 2021, 9, 141. [Google Scholar] [CrossRef] [PubMed]
17. Sharma ML, Kaur S. Neurological Oro-facial manifestations of COVID-19: A scoping review. *Oral Sphere J. Dent. Health Sci.* 2025;1(2):95-110. doi: <https://doi.org/10.63150/osjdhs.2025.6>
19. Zaborowicz, K.; Biedziak, B.; Olszewska, A.; Zaborowicz, M. Tooth and Bone Parameters in the Assessment of the Chronological Age of Children and Adolescents Using Neural Modelling Methods. *Sensors* 2021, 21, 6008. [Google Scholar] [CrossRef]
21. Zhu, H.; Yu, H.; Zhang, F.; Cao, Z.; Wu, F.; Zhu, F. Automatic segmentation and detection of ectopic eruption of first permanent molars on panoramic radiographs based on nnU-Net. *Int. J. Paediatr. Dent.* 2022, 32, 785–792. [Google Scholar] [CrossRef]
23. Orhan, K.; Bayrakdar, I.S.; Zhov, M.; Kravtsov, A.; Özyürek, T. Evaluation of artificial intelligence for detecting periapical pathosis on cone-beam computed tomography scans. *Int. Endod. J.* 2020, 53, 680–689. [Google Scholar] [CrossRef] [PubMed]
24. Tuzoff, D.V.; Tuzova, L.N.; Bornstein, M.M.; Krasnov, A.S.; Kharchenko, M.A.; Nikolenko, S.I.; Sveshnikov, M.M.; Bednenko, G.B. Tooth detection and numbering in panoramic radiographs using convolutional neural networks. *Dentomaxillofac. Radiol.* 2019, 48, 20180051. [Google Scholar] [CrossRef]
25. Liu, J.; Liu, Y.; Li, S.; Ying, S.; Zheng, L.; Zhao, Z. Artificial intelligence-aided detection of ectopic eruption of maxillary first molars based on panoramic radiographs. *J. Dent.* 2022, 125, 104239. [Google Scholar] [CrossRef] [PubMed]
27. Gajic, M.; Vojinovic, J.; Kalevski, K.; Pavlovic, M.; Kolak, V.; Vukovic, B.; Mladenovic, R.; Aleksic, E. Analysis of the Impact of Oral Health on Adolescent Quality of Life Using Standard Statistical Methods and Artificial Intelligence Algorithms. *Children* 2021, 8, 1156. [Google Scholar] [CrossRef] [PubMed]
28. Klingberg, G.; Sillén, R.; Norén, J.G. Machine learning methods applied on dental fear and behavior management problems in children. *Acta Odontol. Scand.* 1999, 57, 207–215. [Google Scholar] [CrossRef] [PubMed]
29. Sawhney H, Bhargava D, Kashwani R, Mishra R. Artificial intelligence as a tool for improving oral cancer outcomes [Internet]. *Arch Dent Res.* 2023 [cited 2026 Feb 09];13(1):15-19. Available from: <https://doi.org/10.18231/j.adr.2023.003>
30. Sawhney H, Bhargava D, Kashwani R, Mishra R. Artificial intelligence as a tool for improving oral cancer outcomes [Internet]. *Arch Dent Res.* 2023 [cited 2026 Feb 09];13(1):15-19. Available from: <https://doi.org/10.18231/j.adr.2023.003>